

## CHAPTER XXI

# Production in High Gear

Failure to deliver the M-4 bridge to the European theater in time for the Rhine crossing was an atypical experience for the Engineer procurement and supply organization during the last months of war. The trend in the previous two years had been toward a sufficiency, in many cases even a plentiful store of supplies. This store was accumulated and distributed within the confines of controls that had become so rigid that it proved well-nigh impossible (as witness the matter of the M-4 bridge itself) to program successfully the production of new items.

The turn of the tide in favor of the United Nations, the shift from a defensive to an offensive position, was grounded in the victories of 1942 at Midway, in North Africa, at Stalingrad, and on Guadalcanal. By the end of the summer of 1943 the Allies had mapped out their grand strategy in Europe and, to a more limited extent, in the Far East, encouraged not only by past successes but, more particularly, by the assurance of a steady flow of men and matériel from the United States. The number of Americans trained and deployed overseas and the quantities of matériel produced and shipped during the last two and a half years of war proved sufficient to win decisively, with but temporary reversals, and this despite the fact that the quantity of men and matériel thrown into the conflict was considerably less than had been projected in the early months of 1942. In the fall of 1942 the ad-

ministration was forced to face the fact that it could not attain the goals set forth earlier. What emerged was a more realistic program that represented a superior balancing of manpower, matériel requirements, and production. It was a program which the logisticians felt was within their power to make good on and yet which permitted the strategists to assume a posture for victory.

### *The Search for a Balanced Supply Program*

The lowering of mobilization goals in the fall of 1942 resulted from a number of factors—the postponement of the cross-Channel attack, the continued shortage of shipping, and, most important, the unqualified pronouncement by the WPB that the \$93,000,000,000 worth of military procurement projected for 1943 was beyond the industrial capacity of the country. It will be recalled that in October the President authorized an Army of 7,500,000 enlisted men for the coming year, a reduction of about 300,000 from the previous goal. This lowering of the troop basis was fundamental to the cut in the Army Supply Program that had been dictated by production possibilities. Drastic reductions in the area of international aid and some savings by way of lowered replacement factors allowed further tailoring of requirements to industrial capacity. After the slashing was finished the ASP (Ground) for 1943 totaled \$18,950,000,000 as against the earlier program of

\$24,000,000,000—a reduction of 21 percent.<sup>1</sup>

The way was paved for large reductions in international aid by agreement between Somervell and the British representative, General Sir Ronald Weeks, in November 1942, when Weeks agreed to scale down British requirements to “the minimum necessary to cover the deficit which cannot be supplied from production under British control” with the understanding that “these requirements . . . do not exceed the British capacity to man or operate as far as their own troops and allies for whom they are responsible are concerned.”<sup>2</sup> Somervell promised in turn that the British would get what they asked for. This settlement marked the end of the long controversy in which the British had held out in favor of a genuine pooling of production with allocation of supplies by theater. The controversy was resolved in favor of the American position that the American Army had first call upon American production.<sup>3</sup>

It took some time for the significance, let alone the effects, of the Weeks-Somervell agreement to filter down to the Supply Division, OCE. Fowler, who had guarded American equipment most zealously against the more liberal attitude of Molnar’s International Branch, let out a new blast at the common stockpile toward the end of December 1942. Fowler, pessimistic about the chances of meeting the ASP, continued to urge that international aid be cut and suggested that the common stockpile be abolished. One year later Fowler himself was to argue successfully for continuation of the common stockpile in opposition to the secretary of the Munitions Assignments Committee (Ground), who recommended its abolition in the interest of uniform control. Insofar as the common stockpile was con-

cerned, the Secretary of MAC(G) contended, the Corps of Engineers was arriving at decisions on the basis of incomplete information as to military operations, military justifications, theater stocks, and other factors about which the International Division, SOS, was well briefed. Requisitions by the British for noncommon items as well as for the needs of the Russians were attended to without relation to the common stockpile, sometimes with wasteful results.<sup>4</sup> Fowler’s defense of the stockpile was comprehensive and firm. The interests of the United States were being carefully guarded. “The adoption of the recommendations can only serve to slow up a procedure which is now working satisfactorily,” he concluded.<sup>5</sup> Fowler’s shift from a lukewarm supporter to a strong defender of the common stockpile is an interesting commentary both upon the extent to which British requirements were cut and upon the relative success of the Engineer procurement program. The common stockpile endured until November 1944.<sup>6</sup>

The reduction in international aid was absorbed almost entirely by the United

<sup>1</sup> For a detailed account of the reduction in the ASP see (1) Leighton and Coakley, *Global Logistics and Strategy*, pp. 602–11, 632–36, and (2) Smith, *The Army and Economic Mobilization*, Ch. III, pp. 77–88.

<sup>2</sup> Quoted in Leighton and Coakley, *op. cit.*, p. 283.

<sup>3</sup> *Ibid.*, pp. 270–74, 277–85.

<sup>4</sup> (1) Memo, Molnar for C of Intl Br, 29 Dec 42, sub: Confs, Tuesday, 29 [Dec] 42. Intl Div file, 400.333, Australia. (2) Memo, Molnar for C of Intl Br, 30 Dec 42, sub: Confs on Wednesday, 30 Dec 42. Intl Div file, 400.291, Stockpile U. S.-U. K. (3) Memo, Secy MAC(G) for Chm, 22 Nov 43, sub: Discontinuance of Engr Stockpile Procedure. 400.291, Pt. 9.

<sup>5</sup> Memo, ACofEngrs Mil Sup for Chm MAC(G), 4 Jan 44, sub: Discontinuance of Engr Stockpile Procedure. 400.291, Pt. 9.

<sup>6</sup> Ltr, Actg Dir Intl Div SOS to CofEngrs, 8 Nov 44, sub: Rescission of Engr Stockpile Procedure. Exec Office Rqmts Div, Read file.

Kingdom. The President had placed the Russian Protocol on his "must" list in view of the importance of the winter campaign in that country. The Russian program was, moreover, relatively small compared to Britain's. Though resigned to the cut in the Engineer portion of the program, Brigadier Blood remarked upon its severity. The reduction as it stood late in January 1943, Blood informed the International Branch, OCE, was entirely in noncommon items. He had estimated requirements in this category (Section III of the ASP) at \$137,000,000. After allowances were made for prior commitments only about \$30,000,000 would remain. The total dollar value of international aid in the 1 February ASP was \$237,904,694.<sup>7</sup>

Adjustments in replacement factors provided a third means of reducing total requirements. Such allowances were henceforth based upon an estimated average overseas strength rather than an anticipated terminal strength as had been the case previously. In addition, certain areas, such as Hawaii, heretofore considered active theaters, were reclassified so that factors were the same as for the United States. Still SOS continued to hammer away at replacement factors, convinced that greater efforts could be made to arrive at more realistic percentages, and suggesting early in 1943 that teams be sent overseas to get at the facts. Four Engineer teams were dispatched to major theaters in the summer, poorly briefed, it was later claimed, and given a cool reception upon arrival at their destinations. Orders from ASF, rather than reports from overseas, were to result in a substantial lowering of replacement factors as the year ran out. In the early months of 1943, however, the Engineers were dominated by a fear of not having put in for enough. High replace-

ment factors served as a cushion against this possibility as well as an assurance of additional matériel in the theaters.<sup>8</sup>

Drastic as were the reductions, the 1943 program promised to tax the nation's industrial capacity. Determination to make stated requirements stick, to establish the ASP as a ceiling upon procurement action, was part and parcel of the plan to tailor requirements to production possibilities. The whip in the new dispensation was the Controlled Materials Plan, a system for distributing raw materials announced by WPB in the fall of 1942, to go into effect the following year. The Controlled Materials Plan put it up to the procurement agencies to state well in advance just how much would be needed and when. There would be little leeway for slipping in additional emergency requisitions. The Engineers, with their uniquely large demands for Class IV matériel, suffered unusual strains in adjusting to the policies established in 1943.

As access to raw materials became more closely tied to firm statements of requirements, the Supply Division exhibited increasing concern about forecasting Class IV needs. Typical of this feeling was Fowler's complaint in September 1942 that the Operations and Training Branch, to which the Supply Division had to look for guidance on requirements for Class IV matériel, "provides us with no information which will

<sup>7</sup> (1) Ltr, C of Engr BAS to C of Intl Br, 25 Jan. 43. Intl Div file, 400.192, ASP. (2) ASP Sec. I, 1 Feb 43. (3) ASP, Sec. III, 1 Apr 43.

<sup>8</sup> (1) SOS Memo S 7000-9-43, 20 Feb 43, sub: Determination of Distr and Maint Factors. 400.314. (2) Memo, C of Rqmts and Stock Control Br for Fowler, 27 Aug 43, sub: Rev Maint Factors. Exec Office Proc Div file, Engr Equip—Spare Parts No. 1. (3) Memo, C of Fld Sv Sup Div for C of Sup Div, 16 Sep 43, sub: Maint Factors. Rqmts and Stock Control Br, Read file. (4) See below, p. 523.

result in advance procurement but only calls on us for materials after definite war plans have been put into effect." He added that "frequently these plans call for early sailing dates which necessitates the rapid assembly of a miscellaneous set of equipment and many shortages."<sup>9</sup> It was a British proposal, heartily endorsed by Fowler, to establish a joint planning committee which would be fed information by the Combined Chiefs of Staff. On the basis of such data the common stockpile could be enlarged, both as to type and quantity, and the Engineer Subcommittee of MAC(G) could make more intelligent recommendations on assignments. The Engineer Advance Planning Committee, with Brigadier Blood, General Fowler, Colonel Gorlinski, and Col. Lewis T. Ross, Troops Division, as well as representatives of the Operations Division and the Transportation Service, SOS, was duly established in September 1942. Shortly thereafter a Class IV Requirements Board was set up within OCE, composed of representatives from the Operations and Training, Requirements, and Development Branches.

The Advance Planning Committee failed to gain access to the requisite information. Lacking such information, the Class IV Requirements Board felt severely handicapped. Approximately how many airfields were to be built? How much port construction was indicated? What geological conditions were likely to be encountered? These were some of the more pressing questions that the Requirements Board felt must be answered if requirements were to be accurately computed and purchase by requisition avoided.<sup>10</sup>

Although the Engineer stockpile had been invaluable, Reybold wrote Somervell on 16 February 1943, it had been necessary all too often "to scour the country for non-anticipated materiel as requisitions were re-

ceived." The Chief of Engineers felt that "at best" such procedures left "too much to chance" and emphasized the increasing difficulty of securing steel and other materials on short notice. Reybold did not mince words. He invited Somervell's attention to "the dangerous situation which may develop due to lack of knowledge . . . of contemplated strategic and tactical plans."<sup>11</sup> Reybold could not have addressed a more sympathetic ear. The Commanding General, SOS, was doing his utmost at this time to acquire a seat in the councils of the General Staff, to demand for logistics something more than its traditional advisory voice in the determination of strategy.<sup>12</sup> For their part, the Engineers were quite willing to settle for information—"any information which may be of use . . . for the purpose of procurement planning based on strategic considerations."<sup>13</sup>

In the relatively more immediate plans of theater staffs there existed a second source of valuable information to which the Operations and Training Branch and the Sup-

<sup>9</sup> Memo, Fowler for Gorlinski *et al.*, 11 Sep 42, sub: Plan-Proc for Engr Equip for TofOps. Intl Div file, 334, Intl Sup Subcomm.

<sup>10</sup> (1) Memo, Deputy Dir Proc SOS for C of Sup Div, 28 Sep 42, sub: CE Prod Program Conf. 337, Pt. 1. (2) Ops Sec Rqmts Br Diary, 24 Oct 42. (3) Memo, C of Rqmts Br for C of Sup Control Sec, 9 Nov 42, sub: Adm Devs. 020, Pt. 1. (4) Memo, Chm Class IV Rqmts Bd (Dawson) for Chm British Engr-U. S. Engr Strategic Subcomm (Fowler), 22 Feb 43, sub: Proc Planning for Engr Class IV Matériel. 400.12, Pt. 1.

<sup>11</sup> Memo, Reybold for Somervell, 16 Feb 43, sub: Proc Plan for Engr Non-T/BA Equip. 400.12, Pt. 114.

<sup>12</sup> For detailed accounts of the Somervell effort see (1) Cline, *Washington Command Post*, pp. 269-78, (2) Leighton and Coakley, *op. cit.*, pp. 649-55, and (3) Millett, *Organization and Role of the ASF*, pp. 111-23.

<sup>13</sup> Memo, Reybold for Somervell, 16 Feb 43, sub: Proc Plan for Engr Non-T/BA Equip. 400.12, Pt. 114.

ply Division sought access. More and more the group of officers at home felt a sense of alienation from their fellows overseas. Temporary liaison officers sent by overseas theaters to Washington on specific missions did not provide a bridge of understanding, Col. Robert H. Burrage of O&T pointed out to his chief, Gorlinski. What a liaison officer knew was confined to his own theater, and often his knowledge even of this area was all too narrow. Burrage continued:

Similarly, it may not be hoped that liaison can be maintained by letter or cable. Answers to specific questions can usually be obtained sooner or later, but rarely is the reply either complete or satisfactory, for neither end knows how the other end is thinking. The theater Engineer is capable and knows what he wants, but rarely does he know what other theaters want or need, whether what he wants is available or will work in with what we must send, nor does he fully appreciate the situation as to procurement, stock-piling and shipping space. On this end, we cannot know all his problems, nor can we learn much of how the equipment we send him is working out. Reports from the field are notable for their absence. This is not strange, for on both ends each has a thousand things to do and no time to go into detail with the other fellow, desirable as it is to do so.

Difficulties of communication loomed all the more serious when coupled with the hard fact that only nine of O&T's forty-two officers had ever seen an active theater and these nine not for twenty-five years.<sup>14</sup>

Yet the prospect for improvement in long-range forecasting of Class IV requirements was not altogether negative. Although information on future strategy was never forthcoming to the extent desired by OCE, much less by ASF, plans for operations against Germany became firm and available to the logisticians in 1943. The decision to go into Sicily and thence into Italy was made at Casablanca in January.

The TRIDENT conference, held in Washington a few months later, fixed 1 May 1944 as the date for the Normandy invasion. At Quebec in August 1943 the landing in southern France was agreed upon. Such decisions eased the total burden, delimiting the area of guessing largely to the Pacific where strategy remained opportunistic. Regardless of the firmness of strategic and tactical plans, visits to theaters by Reybold, Fowler, Somervell, and other officers from OCE and ASF were of great assistance in clearing up bottlenecks and misunderstandings. Monthly reports from the Chief Engineers of the European and Southwest Pacific theaters were valuable aids to communication. First issued in the spring of 1943, these reports described all facets of organization and procedures in the Engineer section of theater headquarters, noted deficiencies in supply and supply planning, and set forth the activities in which engineer troops were engaged. Yet valuable as were these informal sources of information they did not provide the real stuff from which to build statements of Class IV requirements. For this basic data the Engineers looked to the formal channels established by the War Department.<sup>15</sup>

Soon after the invasion of North Africa, ASF, working with the War Department General Staff and the Army Air Forces, developed a number of assumptions as to future strategy in the Mediterranean area for OCE's use in stockpiling Class IV sup-

<sup>14</sup> Memo, Burrage for Gorlinski, 8 Mar 43, sub: O&T Responsibility re Railway Bridging. 417, Pt. 13.

<sup>15</sup> (1) The monthly reports of the Chief Engineer, ETO, are in AMS files; those of the Chief Engineer GHQ SWPA are in EHD files, SWPA Br. (2) For trips overseas by Somervell and his aides, and for a summary of high level conferences, see Millett, *op. cit.*, Chs. IV and V.

plies. OCE compiled a bill of materials covering various construction and reconstruction projects which it was thought would be needed in the theater. Forwarded to North Africa for review in January 1943, this bill of materials was filed away and forgotten until inquiries from the United States became persistent. Finally returned to ASF in June 1943, the theater's version showed drastic cuts in estimates. Yet months before this, quantities in the ASP had been increased to cover the original bill of materials. At this stage of the war, what was surplus to one area could usually be diverted to another. Such exchanges would be less feasible as stocks of supplies were built up and there were limits even at this time upon the readiness with which Class IV supplies could be switched from one theater to another. For all these reasons it was mandatory to improve the accuracy of Class IV estimates.<sup>16</sup>

A new approach, begun early in 1943, put it up to the theaters to make their own assumptions and to develop requirements covering the next twelve or eighteen months. ASF was prepared to authorize stockpiles of Class IV matériel on the basis of such estimates. Responses were disappointing. The submissions varied in scope and contained numerous gaps in data. O&T was inclined to question the usefulness of many items listed. Other items would have to be broken down into their components before procurement could start.<sup>17</sup>

Soon ASF tried another tack, one that though far from perfect was nevertheless to endure. By cable on 1 June 1943, overseas commanders were directed to submit a comprehensive list of major projects anticipated during 1944 and any expected during 1943 which had not been covered in previous estimates. Each project was to be

briefly described and assigned a number—for example, "Project A 16: Rehabilitation Ports of Manila and Olongapo, including construction of 7 piers, 400 X 80 ft." The theater could, if it preferred, compile its own bill of materials for each project or could request that the technical service do this. A bill of materials received from the theater would include only those supplies which would have to come from the United States. If the bill was to be drawn up in the United States, the theater was to indicate what supplies need not be imported because they could be assembled in the theater itself. Projects would show the date when supplies should arrive at the port.

Upon receipt from the theater, projects went first to the Operations Division, War Department General Staff, which was the group best able to relate them to the strategic and tactical plan of the theater concerned and to the over-all strategy of the war. OPD approved the project if it fitted in with these plans and policies. Planning Division, ASF, conducted another review, geared more to logistical considerations, satisfying itself that the project was in general conformity with policies of the War Department and checking for possible duplication in the ASP. The technical service

<sup>16</sup> Plan Div, Office of Dir Plans and Opns ASF, History of Plan Division, ASF (multilithed, n. d.), Vol. II, Pt. IV, pp. 213–14. Unless otherwise noted, the remainder of this section is based upon this study, pages 216–20, and upon (1) *Engineers of the Southwest Pacific*, Vol. VII, *Engineer Supply*, pp. 44, 103–04, 142, 144, 147–48, (2) Liaison Sec Intel Div, Office of Engr ETO, Hist Rpt 3, Supply, pp. 18–35, and (3) Maj Harry F. Kirkpatrick, Development of Supply Planning for Engineer Class IV Supplies (typescript, 20 Dec 45), pp. 11–22.

<sup>17</sup> (1) Memo, ACofS for Opns ASF for Cs of Svs and Staff Divs, 2 Apr 43, sub: Opns Stockpile. P&T Div file, 381, Task Forces, Folio 3. (2) Ltr, AC of O&T Br to CG ASF, 15 Apr 43, sub: Engr Class IV Rqmts. Same file.

concerned (the Transportation Corps and Corps of Engineers were usually the ones concerned) scrutinized the project in more detail. Was it necessary and adequate from both a technical and a tactical standpoint? What, if any, changes were indicated in the bill of materials? At this point the ASP could be revised to include additional requirements. General recommendations and the edited bill of materials were to leave the technical service within 30 days. Final approval by ASF followed and theater and port supply officers were notified that requisitions for noncontrolled items bearing the number of the approved project would be honored automatically. Requisitions for controlled items remained subject to approval by the technical service. Because of the manner in which requirements were to be matched up with, or keyed to, specific operations, this procedure for handling Class IV supplies, formalized by the War Department on 20 September 1943, was known as the "keyed projects system." The keyed projects system was not merely a means of revealing Class IV requirements. It was, in addition, a means of limiting requirements.

Neither in the theaters nor in OCE did the keyed projects system generate enthusiasm. It was recognized, of course, that something of the sort must be done. The Chief Engineer, ETO, had in fact set his staff to work on estimates of Class IV needs for operations on the Continent in November 1942 at which time the cross-Channel invasion was scheduled to occur in 1943. Using twenty-two categories of Engineer activity, the staff was to make up unit bills of materials, showing, for example, requirements for a so-many bed hospital, a so-many man camp, for various types of airfields, maintenance shops, and the like. The number of hospitals, airfields, and other "units"

were to be estimated for the first sixty days of Continental operations as a preliminary step to the final computation of Class IV requirements. Substantial progress was made on these estimates over the next few months. Of particular value was the basic data, set down in the form of staff tables, which could be applied to any future strategic plan. After the Normandy invasion was postponed, the Chief Engineer, ETO, called for new estimates, but they had not been completed before the arrival of ASF's cable inaugurating the keyed projects system. The office of the Chief Engineer, ETO, submitted twenty-eight projects to the War Department, most of them during July and August 1943, covering Class IV requirements in two phases, phase A for the first 90 days of operations on the Continent and phase B for the subsequent 150 days, a total of eight months' supplies. In October 1943, the theater understood that the War Department would have processed all projects by the 25th of that month. In December, however, it was learned that OPD would not, in the absence of an over-all tactical plan, consider any projects which were scheduled during phase B. The ETO Engineers became alarmed. "It may be considerable time before an operational plan for the second phase has been received in Washington and approved," wrote the Deputy Chief Engineer, ETO, in protest. "Meantime, it appears that plans for production should go forward or the material will not be available to support the operation beyond D+90 when requisitions are placed for the second phase."<sup>18</sup>

Such worries were minor compared with those of Engineer officers in the Pacific, where the fluidity of strategic plans, time and distance factors, and an accumulation

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<sup>18</sup> Quoted in Hist Rpt 3, Supply, p. 34.

of shortages rendered detailed forecasting infinitely more difficult. The overriding fear, understandably more extreme in the Pacific, but evident in Europe as well, was that too much time would be consumed in the review and approval of projects and that the theaters would be held too strictly accountable for estimates which had been made before plans had been fully mapped out.

OCE was not long in lining up with the theaters in opposition to the keyed projects system. The procedure had the virtue of putting theater commanders on notice that supplies were not inexhaustible and forced them to focus attention on planning. Submissions of data did bring into the hands of O&T and of the Supply Division a quantity of valuable, long-sought-after information. But the data were neither detailed enough nor submitted far enough in advance of operations to serve as a firm basis for requirements. Descriptions of projects were frequently sketchy; bills of materials, incomplete. Although projects were supposed to be forwarded to the War Department "sufficiently far in advance of the time of execution of the project" to allow for procurement and shipment of the items requested, almost always requisitions accompanied the projects themselves or arrived at the port at the same time that approvals were processed through the War Department. To withhold procurement action until projects had been approved was to invite shortages. The Supply Division therefore made it a practice to make changes in the ASP upon receipt of the project on the assumption that approval would subsequently be forthcoming. Still lacking were the long-range estimates on which to base calculations of materials requirements.

On 17 December 1943, Fowler, just back from a tour of Pacific theaters, discussed the current dissatisfactions with members of his staff. In the Engineers' view, the original purpose of the keyed projects system—understood to be that of initiating procurement in time to assure availability in the theater—was being broadened to encompass control of shipments. This was wrong, the Engineers argued. Estimates supposedly drawn up a year or more in advance were not sufficiently firm to form the basis for issue of supplies. Review of projects might serve a useful purpose to OPD in its overall control of theater activity, but policing should be left to The Inspector General rather than to the technical services. OCE could not pass judgment on the technical and tactical adequacy of projects unless allowed an increase in staff and access to considerably more information about the theater's plans.<sup>19</sup>

The basic change in procedure which OCE advanced to ASF a few days after the conference in Fowler's office was complete divorcement of requirements computations, procurement action, and shipment of supplies from the keyed projects system. The function of keyed projects would be narrowed so as to provide general information. Under this conception, keyed projects need be descriptive only; no bill of materials was necessary. For purposes of computing requirements for inclusion in the ASP, the Engineers suggested that theaters submit a

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<sup>19</sup> (1) Memo, Actg C of Fld Sv Sup Div for ExO Sup Div, 10 Nov 43, sub: Procedure for Handling Rqmts of Special Operating Sup. Rqmts Br, Read file. (2) Memo for File, 20 Dec 43, sub: Conf, 17 Dec 43. Exec Office Proc Div file, Adm Memos, Interoffice. (3) Ltr, ExO OCE to Dir P&O Div ASF, 18 Dec 43, sub: Procedure for Handling Rqmts of Special Operating Sup. 400.314.



net bill of materials, by quarter, for five quarters in advance.

The Engineers got a good measure, but not all of the changes desired. The quarterly estimate system went into effect on 31 January 1944, with the first bill of materials to cover five quarters beginning 1 July 1944 due from the theaters on 1 May. In submitting projects for approval, the theater would describe the job (its approximate size, type of construction, number of buildings, length of runways, and so forth), indicate its place in the logistical plan, and list only the major items (those in short supply) that would have to be shipped from the United States. But quarterly estimates remained tied to keyed projects. The theater was to indicate by project number on its five-quarter bill of materials the projects covered therein. Theaters were informed, however, that the War Department realized the difficulty of forecasting several months into the future. Detail and accuracy were expected for the first two quarters. Figures submitted for the succeeding three quarters would be treated as estimates to be used in procurement planning but subject to revision. In other words, requirements for the first two quarters were to consist of approved current operational projects; requirements for the remaining three quarters, based on anticipated projects, were to be used by OCE as the basis for procurement.<sup>20</sup>

The quarterly estimate system put into the hands of the Supply Division statements of requirements covering a longer period of time than had been forthcoming under the keyed projects system. But OCE continued to feel that there was too close a tie between keyed projects and requirements computations.<sup>21</sup> Was it not unreasonable to expect the theaters to key their requirements to operational projects even for the first two

quarters of estimates? Quarterly submissions were due 60 days in advance. Sixty days was therefore the shortest notice the theaters could give. Equally accurate data was expected for the next 180 days. This was not an impossible task in Europe. But in the Southwest Pacific, Sixth Army had on an average about 60 days' notice of specific operations. In preparation for the landings on Leyte, Sixth Army was given roughly 150 days' notice under the original schedule. A decision to advance the date of the Leyte landings from 20 December 1944 to 20 October reduced the time available for planning to 90 days. The Luzon campaign opened within 120 days of the decision to invade. The Engineer, Sixth Army, was adamant that "in a moving situation such as exists in SWPA where enemy weakness is being timely exploited, careful advanced logistical planning cannot be given in detail or by the project method prescribed." He believed, however, that "the general facilities required in several objective areas—that is during a six or nine months period—will add up about the same if all the localities are totaled."<sup>22</sup> In other words, quarterly estimates should suffice and requisitions against them be honored.

OPD took quite another view of the matter. Review of projects enabled the War Department to balance demands in a two-front war. Review of projects provided a

<sup>20</sup> (1) Memo, Deputy Dir P&O ASF for CofEngrs *et al.*, 28 Dec 43, sub: Sup Proposals Presented by CofEngrs, with Incl. 475, Engr Equip, Pt. 2. (2) WD Memo W 700-44, 31 Jan 44, sub: Engr Class IV Materials and Sup.

<sup>21</sup> (1) Memo, ACofEngrs for CG ASF, 15 May 44, sub: Special Operating Sup. 400, Pt. 2. (2) *Engineers in the Southwest Pacific*, Vol. VIII, *Critique* (Washington, 1951), p. 388. (3) *Final Engr Rpt, ETO*, p. 225.

<sup>22</sup> Memo, Col S. D. Sturgis, Jr., Engr Sixth Army, for CofS Sixth Army, 10 Nov 44. EHD files, SWPA Br, Sixth Army.

means for the War Department to check upon standards of necessity, simplicity, and economy. If the War Department had not instituted the projects, the theaters would have established something very like them for their own use, OPD argued. In the case of the Southwest Pacific theater, OPD noted that projects had been approved far in advance of available cargo space. Indeed it was lack of shipping, within the theater as well as to and from it, that proved the most delaying factor in supply to Pacific areas. At the time of the Leyte operation, for example, the Southwest Pacific theater was well stocked with engineer supplies. The trouble was that these stocks were scattered in such a way as to make it almost impossible to concentrate them in the vital area.<sup>23</sup>

Final judgment as to the efficacy of the keyed projects and the quarterly estimate systems must await a more detailed analysis of theater experience. OCE would have preferred, as did the theaters, less emphasis on projects. But OCE did not have the broad responsibilities of ASF and OPD. For all the checking and rechecking, the projects never attained a high degree of accuracy. Engineers in the Southwest Pacific prepared them on a typical rather than a specific basis. In all theaters, assumptions had to be made. The ETO figured that port facilities would be 75 percent destroyed, bridges on major routes 100 percent destroyed, and roads 10 percent damaged. OCE became fairly well reconciled to established procedures after the introduction of the quarterly estimate system, for this did fill the Supply Division's major need—a reasonably accurate estimate of Class IV supplies well in advance of the time they would be needed. By the time the quarterly estimate system went into effect, moreover, the entire procedure for computing requirements was in

the process of being radically overhauled. During 1944 ASF was to place increasing weight upon past experience in the consumption of supplies as a measure of future requirements. It was possible to do this because production in nearly all categories had more than caught up with demand.

### *The Administrative Reorganization of January 1943*

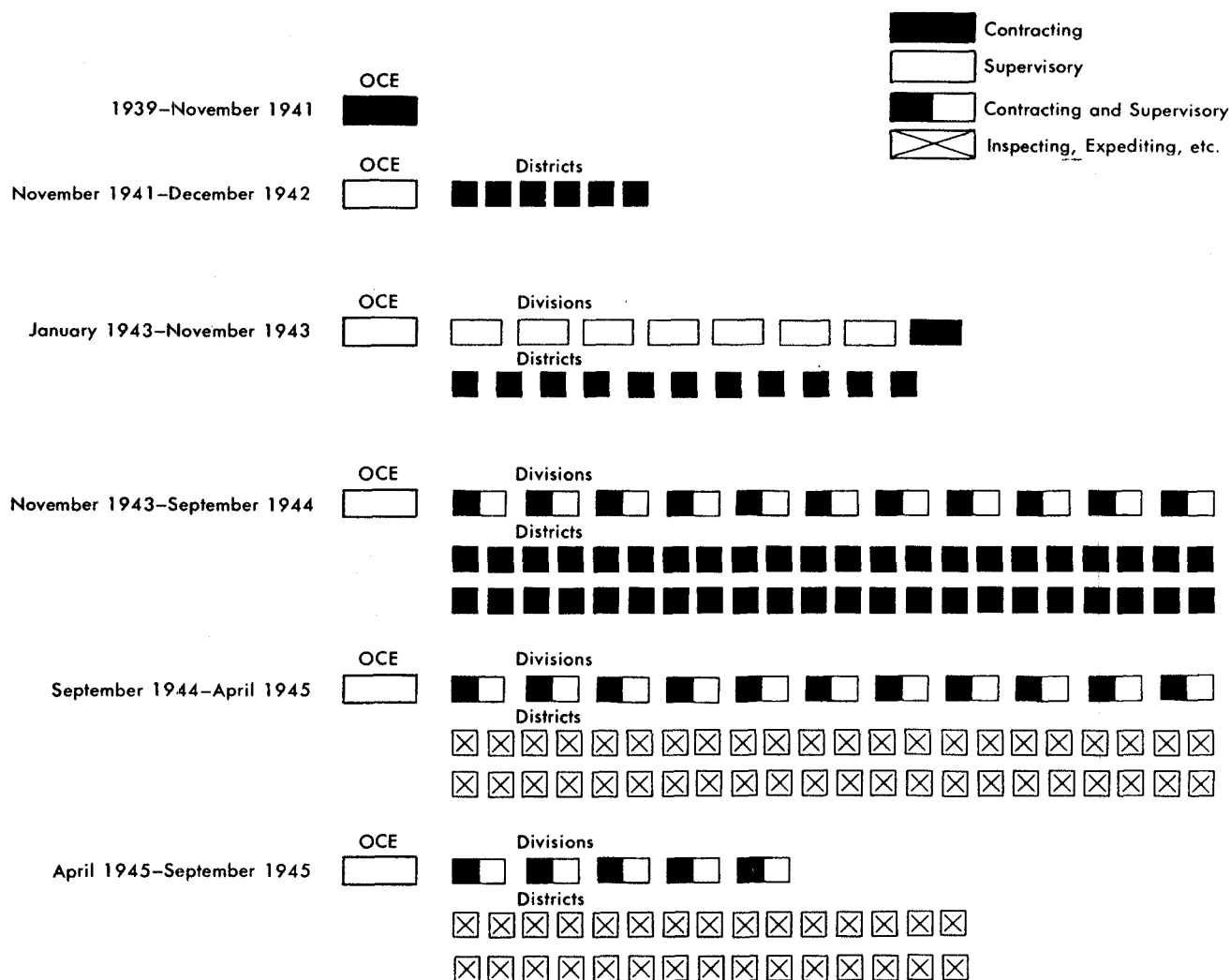
The Engineer portion of the 1 February 1943 ASP was valued at \$1,616,000,000. Thanks to the lowering of the troop basis and the reduction in international aid it was smaller than had been projected earlier. Yet it represented over \$1,000,000,000 more than the value of Engineer deliveries in 1942. In order to complete the 1943 program, deliveries would have to average over \$100,000,000 a month. In only two months previously—August and December 1942—had they reached \$90,000,000. The average for the last six months had been \$77,000,000.<sup>24</sup>

The main hope of attaining the desired acceleration was offered by the prospect of an increase in the supply of steel and by a change in the method of distributing this scarce material. Steel production was expected to increase approximately 7 percent during 1943. The Controlled Materials Plan (CMP) would have replaced the unpopular Production Requirements Plan as a method of distribution by summer. CMP imposed upon the procurement agencies a host of new responsibilities hitherto assumed by the WPB. But neither these new responsibilities nor the character or volume

<sup>23</sup> Ltr, Maj Gen H. A. Craig, Actg ACofS OPD, to Maj Gen Edmond H. Leavey, Deputy Comdr and CofS USAFWESPAC, 14 Jul 45. Dawson personal file.

<sup>24</sup> ASP, 1 Feb 43.

CHART 7—ORGANIZATION AND PROCEDURES FOR HANDLING PROCUREMENT OF SUPPLIES: 1939–45



of Engineer procurement seem sufficient to have dictated the unique organization established to administer them. There were five major reorganizations of field procurement offices during the war years—two of them in 1943. (*Chart 7*) At the peak of procurement activity the Corps of Engineers had fifty-five field offices in operation. The Signal Corps, whose volume of buying most closely approached that of the Engineers, had three field offices. The Quartermaster Corps, which like the Engineers

bought a large variety of commercial articles but in much greater quantity, managed with twenty-eight. In the opinion of some observers, concern for the fortunes of the Engineer Department decreed the size and shape of the Engineer procurement organization.

In the fall of 1942 the Engineer Department employed 70,000 civilians in eleven division and forty-four district offices. Except in the Mississippi Valley where flood control was the determining factor, geo-

graphical boundaries of Engineer divisions conformed to those of ASF's service commands. The Engineer Department had figured in procurement plans from the beginning but only in a minor way, as a source of personnel by way of an expected diminishing of the civil works program. The transfer of military construction to the Corps postponed the tapping of this reservoir. Meanwhile the procurement organization had been tied into the Engineer Department in an unexpected manner. Yet the tie was a weak one. The six District Engineers who doubled as chiefs of the procurement districts reported directly to the Supply Division, OCE. The procurement organization resembled the plans of the thirties much more than it did the structure of the Engineer Department. This resemblance seemed perfect when the Procurement Branch, OCE, relinquished all contracting to the field in the fall of 1942, but it was precisely at this time that the plans of the thirties ceased to have influence.

The Engineer Department was fast approaching the point where numbers of persons could be made available to the procurement program. Military construction projects were to be relatively few in the future. Civil works had already shrunk appreciably and were destined for further decline. The position of the Engineer field organization was rendered yet more precarious by the expansionist tendencies of SOS service commands. The Chief of Engineers could scarcely believe himself appointed to preside over the dissolution of the Engineer Department, to see its experienced construction men lost, perhaps permanently, to the civil works and military construction programs of the future. Thus several years after the event did old-line employees of the Procurement Division sketch in the background of a

change which came to them as a complete surprise and which they regarded as unwise. Since the Engineer Department needed business and the procurement program needed personnel, so ran the logic of those who made the decision, the two organizations should be welded more closely together.<sup>25</sup> But not too closely. On 1 January 1943 the number of procurement offices was increased modestly from six to ten:

- North Atlantic Division
  - New York District
  - Philadelphia District
- Middle Atlantic Division
  - Baltimore District
- South Atlantic Division
  - Atlanta District
- Ohio River Division
  - Pittsburgh District
  - Cincinnati District
- Great Lakes Division
  - Chicago District
- Upper Mississippi Valley Division
  - St. Louis District
- Southwestern Division
- Pacific Division
  - San Francisco District

As outlined by Fowler in October 1942 and as put into effect in January, Division Engineers would be kept in the background. The Supply Division, OCE, would continue to conduct the day-to-day business by direct contact with procurement districts. District, not division, offices would handle all

<sup>25</sup> (1) *Industrial Mobilization for War*, pp. 641, 663. (2) Millett, *op. cit.*, pp. 305-07, 319-29. (3) Management Br Control Div OCE, Organization for Engineer Procurement (typescript, 7 Oct 47) (cited hereafter as Orgn Engr Proc). EHD files. (4) Memo, C of Proc Div for ACofEngrs Mil Sup, 26 Mar 48, sub: Orgn of the CE for Proc of Mil Sup. Exec Office Proc Div file, Orgn CE. (5) Incl, with Memo, C of Constr Control Sec for Reybold *et al.*, 30 Sep 42, sub: Div and Dist Employees. Groves files. (6) Ltr, CofEngrs to Div Engrs, 27 Oct 42, sub: Reorgn of Engr Divs. Exec Office Proc Div file, Proc Dists. (7) For previous organization see above, pp. 177-78, 221.

contracting. In line with previous practice, all 44 districts of the Engineer Department would assist procurement offices by inspections and expediting. Division Engineers would concentrate upon improving administration in the procurement districts. Policies and procedures would be laid down in Washington. For procurement purposes, moreover, geographical boundaries took on a different contour from those of the Engineer Department, the groupings of industrial facilities dictating the areas of responsibility. For example, the North Atlantic Division supervised military construction projects and allied activities in New York, New Jersey, and Delaware only, but was assigned cognizance over procurement activities in the New England states and part of Pennsylvania as well.<sup>26</sup>

Seybold, the chief of the Procurement Branch, and his assistant, Col. George K. Withers, had expressed a preference for departmental boundaries. Indeed Withers believed, and so informed Fowler, that the deviations destroyed "the one advantage" of the reorganization, namely, direct chain of command. Delay and disruption, Seybold and Withers agreed, would result from any change.<sup>27</sup>

If the Procurement Branch, OCE, was lukewarm to the reorganization, the Purchases Division, SOS, opposed it outright. The Purchases Division thought the Engineers had been off the track from the beginning in fostering a territorial breakdown of procurement operations. The Corps should set up three procurement offices, New York and Chicago to carry the main load, and San Francisco the rest, all items to be earmarked for purchase by one or the other. Commodity buying would insure lower prices. Commodity buying would lessen the burdens of the Procurement

Branch which now had the voluminous and complicated task of assigning requisitions to ten offices.<sup>28</sup>

As a matter of fact, much the greater dollar volume of Engineer procurement had in the past been accomplished by commodity buying and this practice was preserved under the new organization. When requirements approached or exceeded overall industrial capacity, Reybold explained to the Purchases Division, ASF, the Engineers purchased by commodity rather than by area. On the other hand, Reybold insisted, geographical procurement was eminently suited to some 27,000 common varieties of items bought by the Corps. It was in the purchase of such articles that the Engineers could offer contracts to small business, channel orders to areas where labor was more plentiful, and discover and utilize new facilities in accord with current policies of the production authorities. Reybold believed it fairer to the taxpayer to spread business than to get the most out of every dollar. Moreover, the closer the location of procurement offices to sources of supply the better would be the administration of the Controlled Materials Plan and the more efficient the handling of production problems.<sup>29</sup>

<sup>26</sup> (1) OCE GO 51, 17 Dec 42. (2) C/L 2241, 14 Jan 43, sub: Mil Sup—Procedures. (3) Memo, Fowler for Tulley, 29 Oct 42, sub: Proc Load on Proc Dists. Exec Office Proc Div file, Misc Corresp. (4) Orgn Engr Proc.

<sup>27</sup> (1) Memo, Actg C (Withers) of Proc Br for Fowler, 16 Nov 42, sub: Placing Proc Dists Under Div Engrs. Exec Office Proc Div file, Proc Dists. (2) Memo, Seybold for Fowler, 19 Nov 42, sub: Reorgn of Proc Dist—Div Engrs. Exec Office Proc Div file, Misc Corresp.

<sup>28</sup> Survey Rpt, Purch Div SOS, 15 Jan 43, sub: Special Proc of Trp Sup by the CE. 400.12 Pt. 1 (C).

<sup>29</sup> Memo, CofEngrs for Dir Purch Div SOS, 29 Jan 43, sub: Special Proc of Trp Sup by CE. 400.12 Pt. 1 (C).

*The Controlled Materials Plan*

Certainly the major task set before the procurement organization at the outset of 1943 was the administration of the Controlled Materials Plan. CMP recognized three materials—steel, copper, and aluminum—as dominating the nation's production. Like the Production Requirements Plan, and unlike the priorities system, CMP was pledged to allot no more of these materials than was available in any one quarter. The concept of distribution under CMP was vertical in contrast to the horizontal system which had characterized PRP. Under PRP the individual manufacturer had applied for his share of materials and WPB had made the allotments. CMP allowed a limited number of "claimant agencies," such as the Army, Navy, and Maritime Commission—seven in all—to bid for their contractors' shares on the basis of established war production programs. The Army got its steel allotment in a lump and parceled it out to the technical services, which divided it among their prime contractors who saw to it that their subcontractors were supplied.

The research, mathematical calculation, and discussion that attended CMP was staggering in its quantity. The prime contractor supplied the claimant agency with a unit bill of materials for his product. The claimant agency extracted the quantity of steel, copper, and aluminum and multiplied this by the number of units scheduled to be produced each quarter. "Lead time," the number of months required from date of shipment of raw materials to delivery of the finished product, was figured into production schedules in order to establish the date when controlled materials were to be made available to the manufacturer. All this data had

to be digested and ready three months in advance of the applicable quarter for presentation to the Requirements Committee, WPB, on which sat representatives of all the claimant agencies. The Requirements Committee looked at the production forecast of steel, copper, and aluminum and rationed out the quantities after due consideration to "must programs," strategic plans, and logistical factors. Each claimant agency then adjusted programs and delivery schedules to conform to its own bulk share. Manufacturers received the revised schedules along with allotments of materials.

The Army was willing, even anxious, to assume this vast burden because CMP afforded to it so much more control over the procurement program than had the priorities system or the PRP. Indignation followed dismay therefore when the WPB widened the door to admit a large number of exceptions. Certain products were clearly unsuited for inclusion under CMP, a vertical system of materials control. These were the so-called shelf items or general industrial supplies—bolts, bearings, motors, and other components. The fabricators of such supplies were general suppliers or vendors rather than subcontractors. They received orders from innumerable producers of end items and would have to depend, if included in a vertical system of allocation, on similar innumerable allotments of controlled materials. CMP left room for use of a horizontal system where administration would be thus rendered chaotic. The Army had no quarrel with this principle. What gave rise to the dismay and indignation was the announcement by WPB that all civilian-type end products would be classed as "B" products along with shelf items and industrial supplies. Commercial items, so the WPB reasoned, were being ordered by

numerous claimant agencies. To avoid administrative chaos, allocation should be by WPB upon application from the manufacturers. The claimant agencies would inform WPB either of the number of units or of the dollar value of B products required. The WPB would then calculate the amounts of material needed in their manufacture.<sup>30</sup>

This decision hit the Corps of Engineers where it hurt. Some 80 percent of the items procured, including tractors, cranes, shovels, air compressors, and the whole long list of more specialized construction machinery, were B products. The first agonized scream of protest went up to SOS on 21 October 1942:

The Corps of Engineers is unwilling to jeopardize its procurement program by allowing other agencies to make decisions which may affect drastically the ability of this office to fulfill its obligations.<sup>31</sup>

And again on 28 October:

The entire question of the handling of Class B products is extremely unsatisfactory. The list of Class B products has apparently been prepared without an underlying philosophy as to the selection of items to be included.<sup>32</sup>

The Corps was to renew its pleas for modification of the B list some months later after CMP had gone into operation.

Meanwhile, following the guidance of ASF, the Supply Division began in November 1942 to gear its administrative machinery to the new materials distribution system. The focal point of CMP management in OCE was the Central Planning Section, Procurement Branch, which was established in December with a nucleus of 100 persons from the Materials Section, including J. M. Wright who retained his position as chief. Intensive recruitment of personnel followed. By March the section had almost 300 on the payroll and the procure-

ment districts had also built up a specialized staff. Training sessions, conferences, visits by Wright and others to field offices, quantities of printed matter—all contributed to the necessarily vast educational process. But work had to begin before the staff understood the job very well.<sup>33</sup>

On 26 November 1942, less than a month before requirements for the second quarter of 1943 were due in SOS, the Supply Division, OCE, instructed procurement districts to secure bills of materials for Class A products. Nothing like complete coverage was achieved in time to be useful. Furthermore, those bills that did arrive on time were incomplete, inconsistent, and lacking in uniformity. The Central Planning Section perforce fell back upon engineering estimates, and in some cases even upon engineering estimates prepared for similar products. In most cases bills of materials and engineering estimates of A products contained the amounts of materials that went into B components, and the Central Planning Branch was only partially successful in segregating one from the other. Additional arbitrary figures had to be set down because information on lead time was imprecise. Uncertainties about Class IV supplies introduced another major element of inaccuracy, since these first CMP estimates were compiled

<sup>30</sup> Unless otherwise noted, the remainder of this section is based upon (1) *Industrial Mobilization for War*, pp. 633, 663–66, 670, 674–79, (2) Smith, *The Army and Economic Mobilization*, Ch. VIII, pp. 140–46, 163–81, 185–97, and (3) Corresp in Management Br Proc Div file, Corresp.

<sup>31</sup> Ltr, C of Sup Div to Dir Prod SOS, 21 Oct 42, sub: Comments on CMP. Management Br Proc Div file, Read file, Capt William E. Dierdorf.

<sup>32</sup> Ltr, C of Sup Div to Dir Prod SOS, 28 Oct 42, sub: Comments on Rev Draft of CMP. Management Br Proc Div file, Jan–Dec 42, Corresp.

<sup>33</sup> CMP and Materials Sec OCE, *History of CMP Operations in CE, 1942–1945* (typescript, 17 Sep 45). EHD files.

some months before ASF called upon the theaters for forecasts of Class IV requirements or for keyed projects. When all these possibilities of error were taken into consideration, SOS Control Division concluded that the initial statement of materials requirements submitted by the Corps of Engineers was "only a fair estimate."<sup>34</sup>

The Engineer effort was typical of the first run of an extremely complicated process. When the WPB faced up to the job of reviewing the submissions as a whole, it found them replete with confusing data. WPB was particularly concerned about the large quantity listed by the Army to cover contingencies, noting particularly that 33 percent of the Corps of Engineers' requirements—to cover unknown demands for Class IV supplies—fell into this category. WPB had no choice at this stage but to provide a substantial reserve for emergencies. But allowances for large unspecified quantities could not continue, for the main idea behind the new allocations system was to assure the flow of materials to approved war production programs. And approved war production programs could not be simply interpreted as just anything the Army might decide to put in for.

The second stage in the CMP process, that of dividing up the materials, was hardly an improvement over the first. WPB had overestimated the supply of steel by half a million tons. There was not enough to go around and cuts had to be made. Allotments forced the following reductions in Engineer programs:

<i>Item</i>	<i>Percent</i>
Tractors, tractor-mounted equipment, cranes and shovels.....	10
Miscellaneous construction equipment and construction material processing equipment .....	15
Mixers, scrapers, and graders.....	30
Spare parts.....	20

By late April 1943 there were indications that third quarter cuts would be even more severe. Processing in WPB's Construction Machinery Branch, which was responsible for the major portion of the Corps' B products, was slow. It was late February—two weeks after producers of A products had received allotments for the entire quarter—before construction machinery plants received allotments for the month of April only. Allotments to B producers for May and June rollings were not forthcoming until late March by which time mill schedules were so set up that a number of emergency rulings were required to assure delivery on the allocations. In April the Construction Machinery Branch, with no steel in reserve, was faced with the need to provide some for emergency requirements. The Engineers had to find the steel. The Supply Division attributed these failures in the system to the inability of the Construction Machinery Branch to identify military orders. Too much steel was flowing to non-essential production, the Engineers claimed, and this was bound to be the case as long as construction machinery remained on the B list, out of reach of those who understood what was needed and when.<sup>35</sup> Construction machinery should be transferred to the A list:

The Chief of Engineers is held responsible for fulfillment of Army Supply Program objectives as regards construction machinery. These objectives are not constant. They shift not only among themselves but in relation to other Army Supply Program items. Since the purpose of the Controlled Materials Plan is to channel materials and production for maximum military effectiveness through a type of

<sup>34</sup> Rpt, Control Div SOS, Feb 43, sub: Survey of CMP. EHD files.

<sup>35</sup> Memo, C of Sup Div for Control Br, 30 Apr 43, sub: ASF Staff Conf. Management Br Proc Div file, Confs and Mtgs.



budgetary balancing process, control over grants of material must be retained by the Chief of Engineers so that his objectives may be achieved by a consideration of total requirements on the one hand and total material available on the other.<sup>36</sup>

Speaking for the other technical services as well as for the Corps of Engineers, ASF had ranged itself against the lengthy B list from the beginning. This viewpoint having found considerable support among WPB officials themselves, by mid-May that part of the B list the Engineers had found so objectionable was on the way out. The first step in this direction was the designation of a group of "Class A Civilian Type End Products," which claimant agencies could elect to handle by vertical allotment. The following month WPB restored the B list to its original concept. Beginning in the fourth quarter only components would be allocated on a horizontal system.

Despite the mountain of work created and despite the problems resulting from the original composition of the B list, the Engineers stoutly maintained their faith in the essential soundness of CMP. The Supply Division noted in June 1943 that while in the past allotments had not served as an absolute guarantee of receipts of controlled materials, there were signs that they would so serve in the future. The Supply Division applauded the discipline that CMP had imposed upon all involved in procurement operations, from contractors, through field offices, to OCE. Improvements in scheduling production were already apparent. More data would be forthcoming on Class IV supplies. The mechanics of the job would be perfected as time went on.<sup>37</sup>

Study of the first two computations made under CMP revealed, for example, that 85 percent of controlled materials were being consumed in the production of some 250

items. Wright and his assistants in the Central Planning Branch therefore decided to concentrate upon attaining greater accuracy in this group. In the summer of 1943 the Analysis Section rechecked the unit weights previously assigned to this equipment, obtaining, as necessary, new bills of materials. The relatively small amount of materials needed for the thousands of minor items procured was arrived at by employing a statistical factor. The Scheduling Section then entered on a requirements transmittal sheet the schedule of monthly deliveries, bracketed these by three-month periods, and made appropriate adjustments for lead time. Unit weights multiplied by unit deliveries equaled total materials requirements.

When total quarterly allotments of controlled materials were received from ASF they were posted in a general materials ledger and subdivided into programs. The first step in withdrawals from this account was taken by the prime contractor who submitted a statement of his estimated quarterly requirements to the CMP group in the appropriate procurement district. There his request was scrutinized in terms of his production schedule and bill of materials. If his estimate appeared reasonable, it was forwarded to the Central Planning Branch where it was subjected to further scrutiny. Did the proposed production schedule agree with the ASP and with the schedule established by the Scheduling Section? What was the relative urgency of the item? The amount of the allotment was thereafter determined, the field notified, and the con-

<sup>36</sup> Ltr, ACofEngrs (Fowler) to ACofS for Mat ASF, 28 Apr 43, sub: CMP Treat for Constr Mach. Management Br Proc Div file, Corresp.

<sup>37</sup> Proc Activities. EHD file, Basic Mats Submitted for Ann Rpt OCE, 1943.

tractor's grant prepared. The Engineers did not invariably receive the quantities of steel applied for under CMP, but, once granted, an allotment could be counted upon and could be distributed and controlled to accord with the best interests of the Engineer program. The order and stability of operations under CMP had, by the fall of 1943, combined with an actual increase in the supply of steel to end the most serious and most persistent cause of production delays.<sup>38</sup>

### *The Shortage of Components*

Until the summer of 1943 the shortage of steel had partly concealed the existence of a shortage of components. So long as there was not enough steel for tanks and trucks and ships there seemed to be plenty of engines. With steel suddenly become relatively plentiful, engines and other components emerged as the nation's number one bottleneck in war production. Never so serious as the steel shortage, the scarcity of components continued until well into 1944. The WPB, anticipating difficulties in this area in view of the greatly increased production programs of 1943, began a timely attack on the problem early that year.

Regulating the production and distribution of components, as the WPB set out to do, called forth a set of techniques different from that needed in regulating the production and distribution of raw materials. A steady and adequate flow of materials to manufacturers of components was essential, of course. The WPB assumed sole responsibility for assuring this under the horizontal system of allocations provided for B products. But components were not solely consumers of raw materials. To a large extent components consumed other components. Once fabricated they were in turn consumed

in countless end items—tanks, planes, tractors, trucks. Ball bearings, crankshafts, carburetors, and magnetos were all needed by the engine manufacturer. In the case of components therefore the WPB had to concern itself not only with the flow of materials but also with the flow of the components themselves, to see that components, as well as materials, were available at the time and place dictated by the needs of various war production programs.

In a move designed to provide an accurate estimate of the quantities of raw materials required and to ascertain whether or not there was sufficient plant for the manufacture of components, the WPB, on 20 January 1943, directed that orders be placed by 6 February for thirty-two so-called critical common components if delivery were desired prior to 1 July. Orders for the last six months of the year were to be on manufacturers' books by 1 March. It took five days for the WPB directive to arrive in the Supply Division, OCE, which was just then in the process of computing requirements for the February ASP. Fowler and other spokesmen for the Engineers were at immediate pains to point out the changes that would be forthcoming upon approval of the ASP and to express concern over future Class IV requisitions. Instructed to do the best they could, they flashed word to the field on 25 January. All requisitions now on hand in district offices must be covered by contracts immediately. All contractors and their subcontractors must be impressed with the necessity for compliance. Procurement districts must stand ready to place additional orders within the next few days after the Supply Division completed the Engineer portion of the ASP. Notices would be in-

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<sup>38</sup> Hist cited n. 33.

formal; standard requisitions would follow as time permitted.

On 26 February, WPB took a second and more important step to assure adequate production and distribution of components. Under General Scheduling Order M-293 which became effective on 1 May, some three dozen components were singled out for special treatment. Manufacturers of the larger and relatively less critical group, which included such items as gasoline and diesel engines, crankshafts, and magnetos, were to file with the WPB their production schedules. Acting upon the advice of the procurement agencies, the WPB would adjust the schedules to conform to those of prime contractors in accordance with the relative importance of the various end products. Once approved, schedules were to remain frozen unless changed by WPB. As applied to the seven most critical components, comprising such items as compressors and dry vacuum pumps, heat exchangers, and turbo-blowers, General Scheduling Order M-293 stipulated that manufacturers of end items seek approval of WPB before placement of orders. Numerous other items were brought under general control by the requirement for filing informational reports. In all three groups WPB reserved the right to cancel, reschedule, or take other action deemed necessary.<sup>39</sup>

Although the Engineers had an interest in nearly all the critical common components which were embraced by General Scheduling Order M-293, it was engines and the components of engines that concerned them most. Their needs centered on the heavy duty, slow speed, so-called industrial engines, as compared with the lighter, high speed automotive type for which the nation had more peacetime productive ca-

capacity. Suppliers of gasoline powered industrial engines were the Buda Company, the Waukesha Motor Company, and the Hercules Motors Corporation. Engineer orders absorbed about 20 percent of the production of these three firms. The Navy and the Ordnance Department took most of the remainder. The Engineers looked to the Detroit Diesel Division of General Motors, where Ordnance and Navy were even more deeply intrenched, to supply engines for tractors and generator sets. The facilities of Detroit Diesel had been expanded twice since Pearl Harbor and in early 1943 were being further enlarged to create a production capacity of 8,000 units per month. Production in February was but 3,753—approximately 1,000 units below forecast. In view of the vital programs which were dependent upon the output of this plant—tanks, landing craft, tractors—the Requirements Division, SOS, had sponsored an informal committee which made recommendations on the allocation of engines to MAC(G). Mid-February brought official recognition in the establishment of the Diesel Engine Sub-Committee of MAC(G), on which the Corps of Engineers was represented by Hassinger. The Diesel Engine Sub-Committee attacked its work in a spirit of intelligence and fairness which won friends both inside and outside the service.

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<sup>39</sup> (1) *Industrial Mobilization for War*, pp. 682–88. (2) Notes of Conf, 25 Jan 43. Exec Office Proc Div file, Salvage and Surplus Mats. (3) Ltr, C of Sup Div to Div and Dist Engrs Having Proc Responsibility, 26 Jan 43, sub: Prompt Placement of Orders Required for Critical Common Components. Exec Office Proc Div file, Proc Policies and Procedures. (4) General Scheduling Order M-293.

Unless otherwise noted the remainder of this section is based upon correspondence in 004.03, Pt. 1, and Exec Office Proc Div file, Engr Equip, Misc Engines.

Company representatives frequently attended its meetings. The WPB, impressed with the smoothness of its operations and noting the fact that no civilian production was involved, allowed the Diesel Engine Sub-Committee to direct the scheduling as well as the allocation of the product. The activities of the Diesel Engine Sub-Committee and the controls imposed by General Scheduling Order M-293 undoubtedly prevented a headache from developing into a crisis. Nevertheless, by summer the Engineers were attributing all their production troubles to the shortage of components.<sup>40</sup>

It must be emphasized that the production difficulties experienced in the summer of 1943 were not nearly so great as those encountered the previous year. The total volume of deliveries remained high. Yet the slippage in the Engineer procurement program was sufficiently large to cause concern at all levels. After a rather unimpressive start in January 1943 when deliveries had totaled but \$83,385,000 and February when they reached but \$85,071,000, the Engineer program had seemed to be reaching its stride. Deliveries in March passed the \$100,000,000 mark and in April reached \$115,000,000. The following month there was a drop, and although a rise occurred again in June, July, and August, when deliveries reached \$119,000,000, the increase was not sharp enough to warrant the hope that the full year's requirements under the ASP—by this time valued at \$1,749,300,000—could be attained. In August the forecast for the year was 92 percent of requirements.<sup>41</sup>

Just what conclusions to draw, just how badly off the Engineer procurement program was, depended to a certain extent on who was looking at the figures and for whom they were being interpreted. On 1

July Fowler admonished the field offices that the trend must be reversed immediately:

The situation is serious—action of the most vigorous sort is called for both in initiating a program and following up to assure that it is carried out. All means such as subcontracting, developing additional facilities, partial cancellation and replacing orders with manufacturers who can produce, as well as the usual means of expediting, securing materials, demanding full use of facilities, securing required manpower, etc. should be called upon.<sup>42</sup>

Early in August the field received another pep letter. Yet engineer matériel was piling up in the depots. At the end of June approximately 80 percent of the items in the common stockpile had reached maximum reserve levels. The paradox of scarcity in the midst of plenty was explicable in terms of distribution. Some products had been delivered considerably ahead of schedule and were, in the parlance of the supply experts "overprocured." By July seven out of eleven major groups of equipment were ahead of schedule. Searchlights, barrage balloons, landing mat, precision instruments, boats and bridging, motorized shops, water supply equipment, nearly all of which had caused some difficulties the year before, fell into this "overprocured" category. More productive capacity, more experience in the fabrication of special military items, more steel and aluminum—these were the factors

<sup>40</sup>(1) Memo, CofEngrs for CG ASF, 16 Jun 43, sub: Engine Sup for Engr Prod. 400.12, Pt. 114.

(2) Memo, C of Liaison—Mach Tool—Facility Expansion Sub-Sec for C of Tractor and Crane Sec, 19 Mar 43, sub: Rpt on Detroit Diesel Engine Mtg, Mar 19, 43. Management Br Proc Div file, Engines, Diesel Detroit 1945, Mach and Equip (C).  
(3) Intl Div ASF, Lend-Lease, pp. 476–83.

<sup>41</sup>ASF Stat Review, p. 78.

<sup>42</sup>Ltr, ACofEngrs to Div Engrs, 1 Jul 43, sub: Deficiencies in Mtg 1943 ASP for Engr Equip. 004.03, Pt. 1.

largely responsible for the upsurge of deliveries. The easing of the aluminum shortage put the mapping equipment program on its feet. Early in the year the Eugene Dietzgen Company, principal source of precision instruments, completed a Navy contract. Thereafter the Engineers had available to them all of the transits manufactured by this firm. Deliveries of searchlights began to soar in February when General Electric's plants got into full operation. Low altitude barrage balloons had been easy to procure even in 1942.<sup>43</sup>

Delivery of so many costly items in such large quantities tended to inflate the over-all dollar value of Engineer deliveries. When cutbacks in these categories of supplies began, the over-all program appeared to have slipped more than was actually the case. In June, with the possibility of aerial attack all but removed, production of searchlights was slowed down to 100 units a month. A second mirror plant at Mariemont, Ohio, on which construction had begun the previous summer, closed in August 1943 without ever having been put into full operation. For the same reason production of low altitude barrage balloons ceased after delivery of 3,212 against an original requirement of 4,130 although production of very low altitude barrage balloons to aid the defense of ships at sea and of amphibious forces continued throughout the year. Although the two types of balloon were similar, the lighter winch required for the very low altitude balloon kept its deliveries behind schedule. One manufacturer of winches lost engineers to the draft, another had difficulty locating a suitable power plant, and another produced a number of unsatisfactory units. Although delivery of the new type of balloon did not lag seriously enough to affect the over-all record appreciably, it did not serve to boost

it either. Even landing mat, for which demand remained high, came in for drastic cuts. The February ASP called for delivery of 230,000,000 square feet of pierced plank mat and for a total of 142,000,000 square feet of Sommerfeld track, Irving grid, and other less popular types. The first four months of 1943 saw delivery of 83,074,000 square feet of pierced plank mat and of 59,259,000 square feet of all other types combined. Thereafter production was planned at a considerably lower level. In May and June the Supply Division diverted almost 8,000 tons of steel from the landing mat program to construction machinery manufacturers. In the fall, 100,000 tons were withdrawn to absorb some of the over-all cuts made in the Army's steel allotment. In August requirements for pierced plank for the year 1943 stood at 206,000,000 square feet; other types at 117,000,000. Purchase of sandbags ceased altogether in August. The Procurement Branch made much of these cuts in explanation of the apparent failure to maintain the degree of acceleration attained in the early months of 1943. The program as it stood, the branch pointed out, was overloaded with problem items—portable generator sets, petroleum pumping stations, motorized shops, refrigerated warehouses, and, most important, construction machinery, all of which

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<sup>43</sup> (1) Memo, Opns Sec Rqmts Br for C of Rqmts Br, 1 Jun 43, sub: Stockpile Procedure. 400.291, Pt. 2. (2) Memo, C of Sup Div for Chorpening *et al.*, 23 Mar 43, sub: Balancing of Proc and Control of Stocks. Intl Div file, 310.1, Intl Div. (3) MPR, Sec. 6, 31 Jan 43, 28 Feb 43, 30 Jun 43. (4) Memo, C of Liaison—Mach Tool—Factory Expansion Sub-Sec for C of Proc Control Sec, 23 Jan 43, sub: Transit Prod at Dietzgen. Exec Office Proc Div file, Prod. (5) Memo, K. M. Skuggs for Maj Thomas B. Gilchrist, Jr., 9 Jan 43, sub: Status of Mach Tools for Gen Electric Co Searchlight Program. Management Br Proc Div file, Gen Electric.

contained engines and other components that were in short supply.<sup>44</sup>

When the shortage of engines began to assume serious proportions, the Procurement Branch reached into the standard bag of tricks to increase its supply of engines to contractors. With an eye to securing exact information for pleading the Engineer cause under General Scheduling Order M-293 and in the Diesel Engine Sub-Committee, the Procurement Branch in March directed the field to submit a monthly report showing the requirements, delivery schedules, and inventory of each prime contractor. The results were disappointing. Reports omitted many purchase orders which according to OCE records were still active. Failure to give order numbers made it impossible to identify a large percentage of Engineer orders on engine builders' schedules. Engine model numbers were confused with those of end items. Totals were inconsistent. In a further effort to get on top of the engine shortage, resident expeditors were assigned to the Buda, Waukesha, and Hercules plants. Since engine builders needed eight to ten months' lead time in order to assure themselves of a steady flow of bearings, carburetors, and other subcomponents, Fowler asked Clay's authorization to contract for end items containing engines as listed in the 1944 ASP. With a word of caution against overprocurement in view of expected downward revisions during the last six months of 1944, ASF approved Fowler's proposal in June.<sup>45</sup>

The Procurement Branch was convinced, however, that the best prospect for a relief of the shortage of components lay in an expansion of facilities for the production of industrial engines. Buda and Waukesha were but "overgrown job shops," Reybold informed Somervell in June. Serious con-

sideration should also be given to the possibility of expanding the foundry industry and to allocating facilities in that industry. The foundries should be allowed to raise wages so that workers would be better compensated for the unavoidably unpleasant working conditions and so induced to remain on the job. Skilled foundry workers should be more effectively protected from the draft, and in fact the entire labor force should be built up so as to keep the industry operating on three shifts.<sup>46</sup>

Having made strenuous representations

<sup>44</sup> (1) Ltr, AC of Proc Br to Dir of Rqmts ASF, 25 May 43, sub: Proc of Searchlights. 470.3 (C). (2) OCE, Record of Factory Expansions Jun 40-Mar 43, WD Financed or Sponsored Through DPC, [c. Aug 43]. Exec Office Proc Div file, Plant Expansion Rpt. (3) Memo for File, 17 Aug 43, sub: Transfer Mirror Plant 2, Mariemont, Ohio. Same file. (4) MPR, Sec. 1-A, 31 Jan 43, 28 Feb 43, 30 Aug 43, 31 Dec 43. (5) ASP, Sec. 1, 1 Feb 43, 1 Aug 43. (6) Engr Bd Hist Study, Balloons, pp. 3, 24. (7) Engr Bd Hist Study, Winches, pp. 21-26. (8) Ltr, AC of Central Plan Sec Proc Br to Priorities and Alloc Review ASF, 9 Feb 43, sub: Distr of Landing Mat Carbon Steel Tonnage for 1st Quarter 1943. 411.5, Pt. 2. (9) Memo, Maj Charles A. Allen, ASF, for C of Steel Sec ASF, 15 May 43, sub: Semimonthly Rpt. 319.1, Semimonthly Rpts. (10) Ltr, AC of Proc Br to CG ASF, 20 May 43, sub: Mats Available for Advance Allot. Management Br Proc Div file, Corresp. (11) Memo, C of Opns Br Proc Sv for C of Proc Sv, 10 Aug 43, sub: Analysis of Recent Prod. Exec Office Proc Div file, Misc Corresp. (12) Memo, C of Proc Control Sec, 16 Aug 43, sub: Special Memo for Use of CofEngrs at ASF Staff Conf of 17 Aug 43. Same file.

<sup>45</sup> (1) Ltr, C of Proc Br to All Div Engrs Having Proc of Mil Sup Functions, 22 Mar 43, sub: Monthly Rpt on Gas and Diesel Engines. 412.5, Pt. 1. (2) Ltr, ExO Proc Br to Various Div Engrs, 24 Jun 43, sub: Monthly Rpt on Gas and Diesel Engines. Management Br Proc Div file, Central Plan Br Directives. (3) Ltr, Fowler to Clay, 8 Jun 43, sub: Immediate Proc of 1944 ASP Engr Items Which Require Internal Combustion Engines, with 1st Ind, 16 Jun 43. Constr Mach Br Proc Div file, ASP Cranes 1944.

<sup>46</sup> Memo, CofEngrs for CG ASF, 16 Jun 43, sub: Engine Sup for Engr Prod. 400.12, Pt. 114.

to the field to improve the quality of its reports, having drawn on the talents of expeditors, having got permission to insure the future, and having recommended the enlargement of facilities, the Procurement Branch declared that all possible angles had been exhausted. The branch cast a doubtful eye upon the possibility of substituting one engine for another, a step that was being urged upon the Corps by the ASF in view of idle capacity at the Chrysler factory. As Reybold interpreted the Procurement Branch's position to Somervell in June:

It is true that there is considerable additional engine capacity, but this consists almost entirely of high speed automotive and tank engines. Few of these would be suitable for Engineer equipment. Investigation also discloses that in most cases it would take until next October or November to get a substitute engine into production due to the lead time required for the component parts. Every effort is being made to meet our deficiencies by this method and several substitutions have already been made, but it is not believed that this method will solve the entire problem.<sup>47</sup>

Unconvinced by these arguments, the Production Division, ASF, took the initiative in discussions with Chrysler. In July representatives of the Chicago and Detroit Engineer Districts accompanied Col. James P. Crowden of ASF to the company's plant where the ins and outs of engineering and production were gone into in detail. Crowden returned to Washington with no real question in his mind but that substitutions were feasible. Chrysler promised delivery of substantial quantities of engines within thirty days, even more within the next two to three months, since the plant had a large inventory of subcomponents on hand. Fowler was persuaded that the automotive engines would prove satisfactory for shovels and cranes at least.<sup>48</sup> By mid-August the Pro-

curement Branch had ordered over 7,000 Chrysler engines and Reybold was referring to the substitution as "the most far-reaching step thus far taken toward the solution of the component difficulty."<sup>49</sup>

Although long-term results were to confirm the truth of this statement, the change-over gave rise to unexpected complications and delays. Crane and shovel manufacturers, with reputations to protect, hesitated and had to be talked to firmly by procurement officials before they could be moved to forsake the old and tried. Further discussion and compromise was in order when the crane and shovel people submitted twenty-six variations on Chrysler's standard product, and crane and shovel models had to be altered to conform to the four or five types that Chrysler would agree to furnish. Chrysler itself found out that it took longer to prepare drawings, patterns, and so on, than its salesmen had estimated. Once committed to the substitution the Procurement Branch pushed it with the vigor born of confidence that here was a real opportunity to break the engine bottleneck, at the same time continuing to urge wage and price adjustments in the casting and forging industry and to suggest that its products be allocated. The Corps felt constrained to

<sup>47</sup> *Ibid.* See also Memo, ExO Mil Sup for Actg CofEngrs, 22 Dec 43, sub: Use of Chrysler T-126 Engine in 30 KW Generator Sets. Exec Office Proc Div file, Engr Equip Misc Engines.

<sup>48</sup> (1) Memo, ExO Mil Sup for Actg CofEngrs, 22 Dec 43, sub: Use of Chrysler T-26 Engine in 30 KW Generator Sets. Exec Office Proc Div file, Engr Equip Misc Engines. (2) Memo, ExO Proc Sv for Col Forney, 15 Jul 43, sub: Substitution of Chrysler Engine in Engr Equip. Same file. (3) Memo, Deputy C of Mats and Prod Br Prod Div ASF for Dir Prod Div ASF, 17 Jul 43, sub: Substitution of Automotive Type Engine for Industrial Type Engine. Same file.

<sup>49</sup> Memo, CofEngrs for CG ASF, 16 Aug 43, sub: Jul Prod. 004.03, Pt. 1.

point out also that the full impact of the use of Chrysler engines would not be felt until 1944.<sup>50</sup>

*The Administrative Reorganization of  
November 1943*

In memorandum after memorandum the Corps of Engineers hammered away at the scarcity of components in explanation of slippage in its procurement program. This correspondence contained no suggestion of administrative failures or of complaints about the field organization. To judge by its silence ASF was similarly content with the administrative set-up. The purchase of tractors, searchlights, barrage balloons, and other key items on a commodity rather than a territorial basis, had insured the flow of contracts mainly to the Chicago and New York Districts, the very offices where ASF's Purchases Division had previously suggested that the work be centralized. The value of allotments made to division offices during fiscal year 1943 showed this picture:<sup>51</sup>

Total-----	\$1, 312, 641, 044
Great Lakes-----	595, 008, 902
North Atlantic-----	347, 769, 265
Ohio River-----	199, 977, 032
Southwestern -----	48, 678, 412
South Atlantic-----	39, 961, 510
Upper Mississippi Valley-----	36, 771, 834
Middle Atlantic-----	29, 873, 743
Pacific -----	14, 600, 346

In view of the seeming satisfaction with the performance of field offices, the second reorganization of 1943, like the first, came as an unwelcome surprise to employees of the Procurement Branch, OCE. Unfriendly critics of the change were convinced that the needs of the procurement program had again been unnecessarily subordinated to what higher echelons believed was the general good of the Corps. In the summer of

1943 the Engineers had more reason to feel threatened than previously. This was the summer when plans were afoot in ASF headquarters to abolish the technical services. On 24 August, one month before these plans appeared in the newspapers, but certainly not before some rumors had circulated, OCE announced its intention to bring the entire Engineer Department into procurement operations. If the determination to maintain the integrity of the Corps be accepted as the motivating force in both reorganizations, the basis of reasoning had certainly changed by the summer of 1943. In January OCE had presumably sought to protect the civil works organization from disintegration by assigning it procurement business. In August the Corps sought presumably to use the river and harbor organization, which had many friends in Congress, as a bulwark against the anticipated raid on its procurement activities and subsequently upon the Corps itself.<sup>52</sup>

The announced purpose of the reorganization was to obtain direct channels of responsibility and straight-line control to improve deliveries, and to increase production. Boundaries would conform to those of the Engineer Department, thus assuring uniformity of command in supply, military construction, and civil works. The additional advantages of proximity to contractors and access to experienced personnel were urged upon ASF as products of the change. But Maj. Frank W. Xiques of ASF's Purchases Division registered strong disapproval of the reorganization. It was time, he thought, for the Corps to show substantial reductions in

<sup>50</sup> *Ibid.*

<sup>51</sup> Ann Rpt OCE, 1943.

<sup>52</sup> (1) See above, pp. 508-10. (2) Orgn for Engr Proc. (3) Memo, C of Proc Div for ACofEngrs Mil Sup, 26 Mar 48, sub: Orgn of CE for Proc of Mil Sup. Exec Office Proc Div file, Orgn—CE.



its field staff. Xiques predicted that with fifty-five offices engaged in procurement, responsibility was going to be spread very thin. Clay expressed some reservations about the plan to split contracting functions between division and district offices.<sup>53</sup> On the whole, however, the Engineers found Clay, an Engineer officer, receptive to the main argument they produced, namely that the new administrative arrangement "takes full advantage of the entire organizational strength of the U. S. Engineer Department . . . for supply matters as well as construction work."<sup>54</sup>

Under the reorganization which took place between 1 September and 1 November 1943, Division Engineers for the first time assumed an active role in procurement operations. Hitherto they had merely supervised the districts. Now they were to secure the contractor and issue a letter purchase order to him. Negotiation of the final contract, expediting, and inspections would be done by the district in which the contractor was located. For small purchases and for items having single sources of supply, the Division Engineer could, if he chose, allow the district to handle the entire sequence. Again, provision was made for commodity purchasing:

Great Lakes Division----- Cranes, shovels, crawler tractors

North Atlantic Division\_ Camouflage equipment, firing devices, searchlights, water purification equipment

Ohio River Division----- Boilers, Bailey bridges, prefabricated steel buildings, gas cylinders, landing mat, machine tools

Southwestern Division-- Asphalt for shipment to east coast and Gulf ports, petroleum testing laboratories, bolted steel tanks

South Atlantic Division-- Wood barracks, assault and storm boats, lumber and plywood for shipment east of the Rocky Mountains

Upper Mississippi Valley Division ----- Steel bridges

Middle Atlantic Division\_ Calcium carbide, laboratory field and soil testing equipment, all items from Canada

Pacific Division----- Asphalt, lumber and plywood for shipment west of the Rocky Mountains, ponton lumber by the Seattle District

Unlike previous commodity assignments, those made in the fall of 1943 did not retain all procurement operations in one office. Instead, the work was divided between divisions and districts.<sup>55</sup>

### *Deliveries: 1943*

In the month of October (before the reorganization had been completed) deliveries of Engineer equipment turned sharply upward, reaching \$136,865,000 worth or more than \$17,000,000 over those of Au-

<sup>53</sup> (1) C/L 2516, 24 Aug 43. (2) Memo, Xiques for Col Phillips W. Smith, 28 Oct 43, sub: Modification of Proc Procedure for Engr Equip and Sup CE. Exec Office Proc Div file, Proc Policies and Procedures.

<sup>54</sup> Memo, Actg C of Sup Div for Dir Mat ASF, 10 Nov 43, sub: Approval of Modification of Proc Procedure for Engr Equip and Sup. 400.12, Pt. 114.

<sup>55</sup> C/L 2578, 13 Oct 43.

gust, the previous peak month. November saw the value of Engineer deliveries climb to \$139,384,000; December, to \$143,106,000. When the final score was totaled up, the Corps of Engineers had met 96.4 percent of the ASP. But by December the ASP was some \$200,000,000 lower than at the end of the summer when the forecast had stood at 92 percent.<sup>56</sup>

Much the greater part of this large reduction in the ASP resulted from drastic cuts in replacement factors which ASF ordered late in August. Reports from the fact-finding teams had not yet come in. As a matter of fact, these reports were never put to use, the stated reason being that they were unreliable. The Engineers never appointed an adequate full-time staff to investigate the subject thoroughly. For a time two civilians sandwiched the study of replacement factors in between other duties; when one of them entered the service in March 1944, the other carried on by himself, still on a part-time basis. The Engineers pointed to low personnel ceilings as the cause of this neglect. But while restrictive policies on hiring doubtless played their part, there is no evidence that the Supply Division pushed for authorization to assemble an adequate staff. Rather the Supply Division seemed content, throughout the war, to let matters drift in much the same way as objected to by Lieutenant Davis in 1942, and for much the same reason, in the belief, according to an officer in the Requirements Branch, that replacement factors provided a "comfortable margin" in the face of shortages.<sup>57</sup>

Although unreasonably high replacement factors had inflated requirements in many cases, in others, notably tractors and shovels, requirements had been realistic enough in terms of need but fantastic in terms of pro-

ductive capacity. Yet so long as the steel shortage persisted, the Supply Division considered it impractical to seek additional plant. At the beginning of 1943, moreover, those officials who would have passed upon a request for expansion of manufacturing facilities had focused their attention on the store of surplus machinery in the hands of the Construction Division. Clay and Michael J. Madigan of Secretary Patterson's office had been referring to this source for months. On 13 February 1943 they instructed representatives of the Supply and Construction Divisions to show results. The Construction Division had in its possession at this time approximately 85,000 pieces of equipment, including over 30,000 trucks. Some of this equipment would have to be retained by the Construction Division, Clay agreed, but most of it, and certainly the machines in better condition, was to be released to the Supply Division. The original understanding was that the use of second-hand machinery would be confined to training centers and to construction in noncombat areas, but provision was soon made to send some used equipment to theaters of operations.<sup>58</sup> As criteria for selection were

<sup>56</sup> (1) Crawford and Cook, *Statistics*, p. 15. (2) MPR, Sec. 6, 31 Dec 43.

<sup>57</sup> (1) Memo, C of Rqmts Br for C of Sup Div, 27 Aug 43, sub: Rev Maint Factors. Exec Office Proc Div file, Engr Equip—Spare Parts No. 1. (2) Memo, CofEngrs for CG ASF, 16 Oct 43, sub: September Prod. Exec Office Proc Div file, ASF. (3) Memo, AC of Rqmts Br for ACofEngrs Mil Sup, 11 Oct 44, sub: Repl Factors. EHD files. (4) Memo, ACofEngrs Mil Sup for CG ASF, 11 Oct 44, sub: Determination of Repl Factors. 400, Pt. 2.

<sup>58</sup> (1) See above, p. 182. (2) Memo for File, 13 Feb 43, sub: Mtg in Gen Clay's Office This Date. Exec Office Proc Div file, Salvage and Surplus Mats. (3) Memo, C of Tractor and Crane Sec for File, 28 Sep 43, sub: Notes on Mtg with Col. Needles, re Rebuilt Constr Mach. Constr Mach Br file, Program Determination 447.

spelled out for Division Engineers on 26 February, equipment destined for overseas should "preferably" be "new, substantially new, or in excellent condition after reconditioning. That slated for shipment to off-continent construction projects should be in "very good or good condition" after reconditioning with only a moderate quantity of spare parts. Troops in training should receive standard makes and models that were in "working condition."<sup>59</sup> The Supply Division prepared a list of machines desired (tractors and shovels were the most desperately needed) and worked up quantities of each type to be rebuilt, reconditioned, or simply certified as suitable for troops in training. The first batch of secondhand machines received at the training centers was universally poor. Tractors arrived without power control units and with attachments that did not fit. Much of the equipment would not run at all without extensive repairs.<sup>60</sup> Early in June when it became evident that deliveries of new construction machinery would be less than scheduled, the Supply Division abandoned all attempts to transfer standard makes and models to the centers. Troops in training in fact had to release standard machinery in their possession for shipment overseas. Division Engineers were urged to make a special effort to round up nonstandard machines to replace those leaving the centers. The field should see that the machines were in "working condition or better."<sup>61</sup> Admonitions to Division Engineers to furnish better machines were of no avail. Early in August the Construction Division found it necessary to do away with the term "working condition" altogether. Henceforth each machine would go into the shop for clean-

ing and repair before shipment to troops in training. As of 15 November when more than 11,000 power machines and trucks had been turned over to the Supply Division, over half of this equipment was still in depots awaiting the receipt of spare parts and attachments. Two thousand machines had been issued to training centers and another 2,500 sent overseas. Although acquisition of this relatively small number of miscellaneous makes and models spelled the difference between something and nothing for many a troop unit in training and overseas, neither in quantity nor in quality was the surplus machinery adequate to meet the present, much less the long term need. The vast treasure that Clay and Madigan pictured simply did not exist. By June 1943 Fowler had concluded that additional manufacturing facilities must be provided.<sup>62</sup>

The light construction machinery that had been chosen with a fast-moving tactical situation in view had not filled the bill overseas where engineer units had been engaged

<sup>59</sup> Ltr, ACofEngrs (Robins) to Div Engrs, 26 Feb 43, sub: Disposal of Excess Constr Equip. 410, Pt. 2.

<sup>60</sup> (1) Ltr, ACof Mats and Equip Br Constr Div to Missouri River Div Engr, 22 Apr 43, sub: Selection and Shipment of Constr Equip for Trp Use. 475 Engr Equip, Pt. 2. (2) Teletype, Mats and Equip Br Constr Div to All Divs, 25 May 43. 413.8, Pt. 16.

<sup>61</sup> Memo, Rqmts Br for C of Mats and Equip Sec Constr Div, 4 Jun 43, sub: Used Constr Equip. Rqmts Br file, 400.17.

<sup>62</sup> (1) Teletype, Mats and Equip Br Constr Div to All Divs, 7 Aug 43. 413.8, Pt. 17. (2) Draft Memo for Dir Prod Div ASF, 26 Nov 43, sub: Reply to Memo on "Sale of Surplus Mats." Redistr and Disposal Br file, Misc Regulations. (3) Memo, Withers for Rosenberg, 25 Jun 43, sub: Expansion of Facilities for Making D-7 Tractors. Constr Mach Br Proc Div file, Caterpillar Tractor Expansion Program.

for the most part on extensive construction jobs. The universal call was for more and heavier machines. The European theater preferred D-8 tractors for Class IV issue. In the future general service regiments were equipped with D-6's instead of D-4's. The number of D-7's assigned to aviation battalions was increased from eight to eleven.<sup>63</sup>

In the opening months of war the choice had been unhesitatingly tanks over shovels, and shovels had inevitably got hurt, as Knudsen had predicted. Eighteen months of tank production and drastic lowering of requirements for tanks had radically altered the relative positions of the items concerned. About the same time that Chrysler's facilities opened up for engine production, the Engineers were offered the use of three plants which had been turning out tanks, and plans were laid to convert two of them to tractor and one to shovel production, the first machines to come off the assembly line early in 1944. Since it was obvious that during 1943 requirements for tractors and shovels had been considerably at variance with production possibilities, ASF allowed the Engineers to lower the ASP.<sup>64</sup>

After this adjustment had been made, only the light tractor appeared grossly behind schedule. Since demand for this type had been falling steadily, facilities and materials had been frequently diverted from its manufacture to that of heavier machines. Next to tractors, shovels lagged most seriously behind stated requirements at year's end. Other types of construction machinery were thrown substantially on schedule by the lowering of replacement factors. (*Table 11*) Deliveries of bridges (except for the treadway) and boats, mapping equipment, and landing mat were generally in line with

stated requirements. (*Table 12*) Redesign and test of the steel treadway bridge following the accidents in the fall of 1942 had taken many months. Fabrication of the new treadway bridge did not begin until summer. Lost time would be recovered early in 1944.<sup>65</sup>

The year 1943 was marked by steady progress toward systemization in procurement of supplies. Requirements were stated with more authority and were related more realistically to the quantity of steel and components available. While somewhat short of stated goals, the delivery of \$1,388,000,000 worth of Engineer supplies in 1943 was more than double the value of deliveries in 1942. The value of transfers to international aid was almost 33 percent more than the year before, amounting to \$57,325,000.<sup>66</sup>

<sup>63</sup>(1) Memo, Fowler for Hassinger, 30 Apr 43, sub: Tractors. Constr Mach Br file, Trp Rqmts 43. (2) T/O 5-415, 1 Apr 42. (3) T/O&E, 5-415, 15 May 44. (4) T/O 5-21, 1 Apr 42. (5) T/E 5-22, 26 Oct 43. (6) Ltr, Dir of Base Sv Hq AAF to CofSup Div OCE, [c. Jan. 43], sub: Increased Alloc of D-7 Caterpillar Tractors for Avn Engr Bns, with 1st-4th Inds. 451.3, Engr Avn Units, 1943.

<sup>64</sup>(1) Ltr C of Proc Br to Great Lakes Div Engr, 28 Jun 43, sub: Additional Crane and Shovel Purch From Lima Locomotive Works, Inc. Constr Mach Br Proc Div file, Lima Locomotive Works. (2) Ltr, C of Tractor and Crane Br to C of Sup Div, 24 Jul 43, sub: First Progress Rpt Caterpillar—American Car and Foundry D-7 Expansion. Exec Office Proc Div file, Misc Corresp.

<sup>65</sup>(1) Memo, CofEngrs for CG ASF, 16 Oct 43, sub: September Prod. Exec Office Proc Div file, ASF. (2) Memo, Fowler for Reybold, 18 Dec 43, sub: Computation of Rqmts and Ann Delivery for Year 1943, CE. Exec Office Proc Div file, Adm Memos. (3) See above, pp. 486-89. (4) 1st Ind, 12 Jul 43, on Memo, ExO Sup Div for C of Fld Sv, 5 Jul 43, sub: Treadway Bridge Rqmts. Rqmts Br Read file.

<sup>66</sup>(1) Crawford and Cook, *op. cit.*, p. 15. (2) Whiting, *Lend-Lease*, p. 11.

TABLE 11—CONSTRUCTION MACHINERY: ANNUAL REQUIREMENTS AS OF FEBRUARY, AUGUST, AND DECEMBER 1943 AND ACTUAL DELIVERIES IN 1943

Item	Requirements			Deliveries 1943	Over or Short December Requirements
	February	August	December		
Auger, earth, skid mounted, gasoline engine driven.	280	280	250	268	+18
Compressors, air:					
Trailer mounted, pneumatic tires, diesel engine driven, 315 cubic feet per minute	609	609	465	497	+32
Truck mounted, gasoline engine driven, 105 cubic feet per minute	2,270	2,270	2,270	2,234	-36
Crane, tractor operated, non-revolving, 20-ton, 20-foot boom	293	293	263	267	+4
Cranes and shovels, crawler mounted:					
½-cubic yard, 5- to 6-ton, Class II	1,489	1,490	1,179	1,322	+143
¾-cubic yard, 7- to 10-ton, Class III	322	945	722	837	+105
1- to 1½-cubic yard, 20- to 30-ton, Class IV	27	411	350	325	-25
1¾- to 2-cubic yard, 30- to 40-ton, Class V	72	195	215	240	+25
2½-cubic yard, 45- to 60-ton, Class VI	15	85	40	55	+15
3- to 4-cubic yard, 65- to 75-ton, Class VII	8	54	41	17	-24
Cranes and shovels, rubber tired:					
¾-cubic yard, 4- to 8-ton, Class X	531	641	652	535	-117
¾-cubic yard, 8- to 12-ton, Class XI	200	790	245	218	-27
¾-cubic yard, 14- to 18-ton, Class XII	(a)	310	592	310	-282
¾-cubic yard, 20-ton, Class XIII	(a)	134	92	95	+3
Single engine driven, self-propelled, 8- to 15-ton, Class XIV	(a)	467	290	220	-70
Crushing and screening plant, 2-units, gasoline engine driven, semitrailer mounted, 25 cubic yards per hour	390	193	185	186	+1
Distributor, bituminous material, trailer mounted, 1,250-gallon	254	254	254	254	0
Ditching machine, ladder type, crawler mounted, gasoline engine driven, digging depth 8 feet, width 18 to 24 inches	315	315	315	321	+6
Graders, road:					
Motorized, diesel engine driven, 12-foot moldboard	2,115	2,275	2,275	2,598	+323
Towed type, leaning wheel, hand controlled, 12-foot moldboard	723	723	723	773	+50
Mixers:					
Concrete, gasoline engine driven, trailer mounted 14-cubic foot	361	802	802	787	-15
Pugmill, with dryer and soil stabilization unit, semitrailer mounted	135	135	135	135	0
Rollers, road:					
Gasoline engine driven, 3-wheel, 10-ton	908	908	838	952	+114
Gasoline engine driven, tandem, 2-axle, 5- to 8-ton	315	345	345	354	+9
Towed type, sheepsfoot, 2-drum-in-line	532	532	532	534	+2

TABLE 11—CONSTRUCTION MACHINERY: ANNUAL REQUIREMENTS AS OF FEBRUARY, AUGUST, AND DECEMBER 1943 AND ACTUAL DELIVERIES IN 1943—Continued

Item	Requirements			Deliveries 1943	Over or Short December Requirements
	February	August	December		
Rooter, road, cable operated, 3-tooth-----	535	535	535	620	+ 85
Saws:					
Chain, portable, pneumatic, 24-inch blade-----	(a)	(a)	(a)	5, 375	-----
Chain, gasoline engine driven, 36-inch blade-----	4, 820	4, 820	4, 820	4, 820	0
Circular, woodworking, portable, penumatic, 12-inch blade-----	(a)	(a)	(a)	4, 171	-----
Scrapers, road:					
Motorized, cable operated, 12-cubic yard-----	99	575	390	409	+ 19
Towed type, cable operated, 6-cubic yard, Type II-----	(a)	(a)	(a)	250	-----
Towed type, cable operated, 8-cubic yard, Type III-----	2, 001	2, 001	2, 001	2, 045	+ 44
Towed type, cable operated, 12-cubic yard, Type IV-----	445	445	445	445	0
Semitrailer, low bed, rear loading, with dolly, 20- ton-----	464	464	464	490	+ 26
Tractors, crawler type, diesel engine driven, com- plete with accessories:					
91 to 140 drawbar horsepower, Class I-----	3, 848	3, 848	3, 125	2, 972	- 153
61 to 90 drawbar horsepower, Class II-----	4, 000	4, 000	3, 200	<sup>b</sup> 3, 178	- 22
46 to 60 drawbar horsepower, Class III-----	2, 400	2, 400	2, 000	<sup>b</sup> 2, 049	+ 49
36 to 45 drawbar horsepower, Class IV-----	9, 000	9, 000	8, 000	<sup>b</sup> 7, 396	- 604
Trailers, full, low bed:					
8-ton-----	1, 526	3, 918	3, 152	3, 152	0
16-ton-----	2, 685	2, 685	2, 504	2, 577	+ 73
20-ton-----	149	271	204	256	+ 52
Welder, electric arc, gasoline engine driven, 300 amp, skid mounted-----	526	921	1, 022	1, 318	+ 296

<sup>a</sup> Requirements not shown in available records.

<sup>b</sup> These figures differ from those in Crawford and Cook, *Statistics*, which have been adjusted to include procurement by Ordnance Department.

Source: (1) ASP, Sec. 1, 1 Feb 43 and 1 Aug 43, (2) MPR, Sec 1-A, 31 Dec 43, 31 Jan 44, 29 Feb 44, (3) Crawford and Cook, *op. cit.*, pp. 25-27.

TABLE 12—MISCELLANEOUS EQUIPMENT: ANNUAL REQUIREMENTS AS OF FEBRUARY, AUGUST, AND DECEMBER 1943 AND ACTUAL DELIVERIES IN 1943

Item	Requirements			Deliveries 1943	Over or Short December Requirements
	February	August	December		
<i>Boats</i>					
Assault, M-2, without paddles or canvas bag.....	17,696	19,725	19,725	19,899	+174
Landing, pneumatic, rubber, 10-man.....	(a)	3,274	3,274	820	-2,454
Reconnaissance, pneumatic, canvas, 2-man, with- out paddles.....	1,952	4,135	4,135	4,089	-46
Storm, plywood.....	1,607	1,607	1,392	1,407	+15
Utility, gasoline powered, 18-foot.....	451	451	451	457	+6
Motor, outboard, with chest and spares, 22 hp..	3,286	3,406	3,406	4,044	+638
Motor, outboard, with chest and spares, 50 to 55 hp..	2,748	2,892	2,892	2,505	-387
<i>Bridges</i>					
Fixed, steel, panel, Bailey type, M-2, widened roadway.....	500	500	500	520	+20
Ponton, steel, 25-ton.....	2,748	2,748	2,748	2,858	+110
Semitrailer, special, drop frame, 25-ton, ponton....	1,250	1,730	1,730	1,979	+249
Treadway, M-2:					
Floats, pneumatic, with emergency kits, 18-ton, M-1, with carrying case.....	(b)	2,760	2,760	437	-2,323
Saddle, steel, treadway, knockdown type, M-1, 18-ton.....	(b)	(b)	(b)	827	-----
Truck, cargo, 6-ton, 6 x 6.....	1,391	1,391	1,391	688	-703
<i>Mapping Equipment</i>					
Alidade, miniature, telescopic, Type B, with leather case and accessories.....	(a)	1,300	(c) 950	890	-60
Alidade, telescopic, with stadia arc, Type A.....	1,272	1,272	c 1,170	1,110	-60
Camera, copying, 24 x 24-inch.....	44	44	63	65	+2
Compasses:					
Lensatic, luminous dial, liquid filled, 5 degree, 20 mil graduations (thousands).....	195	337	337	337	0
Watch (thousands).....	540	(a)	(a)	(d)	-----
Wrist, liquid filled (thousands).....	(a)	1,065	(a)	1,365	-----
Level, small engineer, with tripod and accessories..	1,033	(a)	1,033	1,295	+262
Press, lithographic, offset, motor driven, 110 V, 60 cycle, AC, 20 x 22 1/2-inch size.....	75	75	160	161	+1
Stereocomparagraph.....	221	229	303	303	0
Stereoscope, magnifying mirror, with binoculars and case.....	4,864	4,864	6,049	6,463	+414

TABLE 12—MISCELLANEOUS EQUIPMENT: ANNUAL REQUIREMENTS AS OF FEBRUARY, AUGUST, AND DECEMBER 1943 AND ACTUAL DELIVERIES IN 1943—Continued

Item	Requirements			Deliveries 1943	Over or Short December Requirements
	February	August	December		
<i>Mapping Equipment—Continued</i>					
Transit, small, engineers:					
Night illumination, 1-minute reading, with accessories and tripod, Type I-----	2, 412	2, 412	2, 230	2, 237	+ 7
Night illumination, 20-second reading, with accessories and tripod, Type II-----	1, 930	1, 930	1, 930	1, 930	0
Mat, airplane, landing, steel, pierced-plank type, in bundles (thousand square feet)-----	230, 000	206, 000	189, 700	197, 006	+ 7, 306

<sup>a</sup> Requirements not shown in available records.

<sup>b</sup> New model under development.

<sup>c</sup> MPR, Section 1-A, for December, combined the two types with total deliveries of 1,110. In January 1944, Type B was given for the first time, with delivery of 890 in 1943. MPR's prior to December 1943 gave Type A only, with deliveries higher than could be possible if 890 Type B were made and 1,110 was actually the combined figure.

<sup>d</sup> This was the actual delivery total in May, the last time the watch compass was reported. At that time, over-procurement to a total of 1,021,387 had been authorized.

Source: (1) ASP, Sec. 1, 1 Feb. 43, 1 Aug 43. (2) MPR, Sec. 1-A, 31 May 43, 30 Nov 43, 31 Dec 43, 31 Jan 44, 29 Feb 44. (3) Crawford and Cook, *op. cit.*, pp. 25, 27-28.